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So many requests are received from abroad for parts of the *Agricultural Journal* which were never published that the following list of all issues is given for reference. Attention is directed especially to Volume VII which had only one part:—

Vol.			*Vol.*		
1.	3 numbers,	1928	8.	4 numbers,	1935–7
2.	4 ,,	1929	9.	4 ,,	1938
3.	3 ,,	1930	10.	4 ,,	1939
4.	4 ,,	1931	11.	4 ,,	1940
5.	2 ,,	1932	12.	4 ,,	1941
6.	2 ,,	1933	13.	4 ,,	1942
7.	1 number,	1934	14.	4 ,,	1943

ISSUES OF THE AGRICULTURAL CIRCULAR.

THE following were the numbers and year of issue of the *Agricultural Circular:*—

Vol. 1, 1920, 12 numbers.
,, 2, 1921, 5 ,,
,, 3, 1922, 4 ,,
Vol. 4, 1923, 1 number.
,, 5, 1924–5, 2 numbers.

As number 4 of Vol. 3 was printed as " Volume 4 " and number 1 of Vol. 4 as " Volume 5 " it would appear from an inspection of a complete set that Volume 4 comprised only a number 4 and that there were two issues of Volume 5, Part 1.

OLD ISSUES OF AGRICULTURAL BULLETINS.

FREE copies of the following Bulletins are available to Colonial Departments of Agriculture, research institutes and bona fide planters, etc.:—

No.
1. Sisal Hemp in Fiji, 1911.
3. Rhinoceros Beetle in Samoa, 1912.
4. The Banana in Fiji, 1912.
5. Scale Insect on Bananas, 1913.
6. Lemon Grass, 1913.
7. A Mission to Java for a Coleopterous Pest of Bananas, 1914.
8. Coconut Experiments, 1915.
9. Soils of Fiji—I., 1916.
11. Alluvial Soils of Fiji, 1919.
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13. Sea Island Cotton, 1920.
14. Transparent Coconut Scale, 1921.
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17. Early Nutfall in Coconuts, 1930.
18. Control of Coconut Spike Moth, 1935.
19. Fruit Fly Investigations, 1936.
21. Biological Control of the Rhinoceros Beetle, 1941. Price 1s.
22. An Introduction to the Mosquitoes of Fiji, 1943.
Fijian Plant Names, 1942. Price 3s. 6d., 4s. and 6s.

Applications should be made to the Librarian, Department of Agriculture, Suva, Fiji.

—EDITOR.

CONTENTS.

VOLUME 15, No. 2, JUNE 1944.

EDITORIAL 31

SOILS OF THE GENERAL EXPERIMENT STATION, SIGATOKA *by W. J. Blackie.* SOIL INVESTIGATIONS, PART 4 33

SOIL CONSERVATION *by H. W. Jack* 36

MAIZE SEED SELECTION *by C. M. Dass* 39

CULLING OF DAIRY HERDS FROM FACTS *by J. J. C. Suckling* 41

FURTHER NOTES ON RICE VARIETIES *by D. A. Donald* 43

ENTOMOLOGICAL NOTES *by R. J. A. W. Lever*—

1. Fruit Flies and Their Parasites 45
2. The Filarial Mosquito, *Aëdes scutellaris pseudoscutellaris* .. 46
3. On the Breeding Places of some Local Mosquitoes 47
4. The Cutworm, *Prodenia litura* F. and its Parasites 46
5. Banana Beetles 46
6. Dung Preferences and Nomenclature of the Local House Fly . 49
7. Nomenclature of some Mosquitoes and a New Local Record 49

LETTERS TO THE EDITOR (SHINGLE ROOFS) 50

FRUIT AND VEGETABLE PRICES, SUVA 52

REVIEWS—

1. Need for Agricultural Research in the Colonies 53
2. Impressions of a Visit to East and West Africa by the Secretary of State for the Colonies.. 54
3. Russia's Sub-tropical Crops 54
4. Mosquito Control by the Freon Bomb 55
5. Competitive Rubber Plants 55
6. Weed Flora of Fiji 56
7. Sugar Cane Replication 56

EXTRACTS—

Modern Nebuchadnezzar 42

1. United States Food Conference (Hot Springs) 57
2. Sugar Cane and Spread of Insects 57
3. The New British Countryside, The Harvest 58
4. Chemists for Victory 59
5. Artificial Breeding 59
6. Agriculture in Britain 60
7. Insecticide—Resistant Insects 60
8. Destruction of Insects in Planes 60

MAP OF FIJI .. .. end cover

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AGRICULTURAL JOURNAL

ISSUED BY THE

DEPARTMENT OF AGRICULTURE, FIJI.

VOL. 15.] JUNE, 1944 [No. 2

EDITORIAL.

THERE is no doubt of the value of the copra industry to the people of the Colony and producers will gladly welcome the recent substantial increase of price which has been generously granted by the Ministry of Food, London. Copra is of special value to the prosecution of the war and will be needed for years to provide sustenance for the peoples of Europe after the war. Hence, it is of the utmost importance that, as a war effort, all producers should make strenuous endeavours to increase production forthwith as much as possible.

In such endeavours, the present material wastage due to the manufacture of poor quality copra should be eliminated and it is hoped that the widening of the price margin between the local standard grades will stimulate planters to produce a much higher percentage of good grade copra than has been the practice in the past. Such an attainment would provide better returns to the producers and definitely enhance the reputation of our commodity, thus placing the Colony on a firmer footing as regards a market after the war.

In this issue of the *Journal* the Senior Chemist provides an interesting survey of the soils at the General Experiment Station, Sigatoka. Data indicate that the average rainfall is about 70 inches per annum and that precipitation occurs on 157 days, no month having rain on less than 8 days on the average.

The main soil types are described, those on the flats being fertile silty clay loams, while the hillside soils are shallow and poor brown sandy loams. The low acidity and low lime requirement are remarkable characteristics of all the soils and the high contents of available phosphates and exchangeable bases definitely indicates soils of high fertility. For field use a soil map has been made from the data obtained in this valuable and interesting article.

The soil is our greatest heritage and yet it is frequently despoiled by the activities of man so that attention is invited to a brief note portraying the intrinsic value of our soils and the real need for soil conservation in the Colony. The note indicates that some thought had been given to the problem before the war and that a start was planned on a small scale and put into operation on some experimental areas, schools, etc. which now afford satisfactory demonstrations of the useful effects of such work as terracing, contour cultivation, strip cultivation and other forms of combating soil erosion.

With the war now receding from Fiji it is highly desirable that soil conservation work should again be given the attention it merits and put into operation on a large scale and with adequate equipment.

Maize is grown in most parts of the Colony, particularly in dry zones, but average crops are low partly because little attention is given to the importance of using the best seed available. In this issue a useful article indicates that material improvement in cropping would result from the use of carefully selected seed. The most important points in seed selection of maize, both in the field and in the barn are described and it is hoped that growers will put the advice given into practice with beneficial results to their crops.

The advantages derived from herd testing are well known to dairy farmers and yet herd testing on businesslike lines has not yet been adopted as a regular practice in a number of our dairy herds. A practical note on the culling of dairy herds directs farmers to the need for eliminating unprofitable milkers from the herds and indicates how the farmer can readily test his own cows with the help of the chemist. It would be advantageous to most dairy farmers to put into systematic operation the simple methods suggested in the article so that their better milkers may be segregated from the wasters with general economic advantage to the farm. Accordingly, it is hoped that all dairy farmers will make a real effort to cull their own herds and utilise the present good prices for beef.

Some further notes on rice varietal trials at the General Experiment Station, Sigatoka, are significant of the importance that is attached to this staple food crop in these times. These notes compare the yielding abilities of 16 varieties harvested in 1943 from a series of replicated plots. While the mean yields shown in table 2 of the notes indicates a wide range of yielding abilities, statistical analyses so far reveal little significance, so that the trials must be conducted for a further 2 to 3 years before the best yielders can be selected with certainty. This work is of considerable importance because it is very evident that too many varieties are planted in each rice area in the Colony and better results would be obtained from a selection of the best few varities based on data collected from carefully replicated plots.

The Entomological Notes deal with some of the less usual breeding places of local mosquitoes and particularly with the filarial mosquito which seems to act also as a dengue vector. The " via " or wild dalo is well known to all and it is surprising to find that the botanical name in general use for it belongs to a scarcer Pacific species. Further notes on the common cutworm and its parasites are followed by recent details about certain banana beetles and observations on the house fly. The parasites recorded in the last *Journal* from fruit flies in bread-fruit are described in some detail. A new record is the Melanesian mosquito *Geoskusea*, specifically undetermined.

The interesting article on the utilisation of house shingles which appeared in the March number has given rise to correspondence to which the author has replied. If wooden shingles can give almost permanent roofs we shall be able simultaneously to use a local material to replace an unobtainable import and to improve the comfort and appearance of Fijian houses.

The market prices of fruit and vegetables in Suva should be of assistance to all and make interesting comparison with those which appeared in September 1942 and 1943.

Extracts and reviews deal with a wide variety of interesting subjects.

SOIL INVESTIGATIONS, PART 4.

THE SOILS OF THE GENERAL EXPERIMENT STATION, SIGATOKA.

By
W. J. BLACKIE, F.I.C., M.Sc., F.N.Z.I.C.,
Senior Chemist.

THE General Experiment Station, Sigatoka, consists of some 80 acres of flat land and some 200 acres of hill country comprising the areas known as Rogosavu, a portion of Vuniraracilaga Matovo and Sigatoka Experiment Station proper, in the district of Nokonoko, Province of Nadroga. The area of the station is defined in plans N1277, N1278, N1052 and N29 of the Lands, Mines and Survey Department.

The station is bounded on its eastern extremity by the Sigatoka River and the cultivated alluvial flat area rises steeply to the west and south into reed-covered hills. The northern extremity continues into narrowing alluvial flat areas until the steep hilly country is reached with the eastward swing of the Sigatoka River at a point approximately 13 miles from the coast.

The station is situated approximately four miles from the Government Station of Lawaqa and is accessible by road and river. The cultivated areas have an almost flat relief, the hilly portions being as yet unused. Steeply rising hills in a series of east and west parallel ridges meet these flats abruptly and cultivation extends to the junction of the two. The elevation of the flat lands in relation to a slow-flowing river with its mouth four miles distant is some 25 feet above sea level.

The characteristic vegetation of the hills consists of reeds and coarse grass interspersed with occasional guava and low shrubs. The flats of the station have been cleared, but further up the river guava and wet-zone bush are dominant on uncleared areas.

A study of the data on precipitation of rainfall in inches and its distribution over the last 16 years shows that the station, although tending to a dry zone climate, is more nearly inter-zonal. The detailed data as supplied by the Officer in Charge of the station are recorded below. The rainfall and distribution show average figures over 16 years.

TABLE 1.

Month	Precipitation.	Distribution (in days).	Mean maximum temperature (°F) for 1943.	Mean minimum temperature (°F) for 1943.
January ..	9·21	16	88·1	69·4
February ..	9·01	17	87·5	69·3
March ..	9·81	19	88·6	70·0
April ..	7·71	14	87·0	67·8
May ..	5·07	14	84·2	64·4
June ..	2·61	9	81·7	61·2
July ..	3·15	10	79·4	59·5
August ..	3·02	9	82·8	62·8
September ..	3·21	8	84·0	65·1
October ..	3·71	10	85·6	65·7
November ..	4·89	12	87·9	65·9
December ..	7·77	13	88·9	69·4
Total ..	69·17	157	....	....

The flat land of the Station is a portion of some 16,000 acres of alluvials located in relation to the east and west banks of the Sigatoka River. The greatest width of this alluvial strip is some three miles, the narrowest portion

a little less than 100 yards at the southern extremity. The Station has the greatest width of flat land of some 400 yards in the Northern Section dropping to less than 100 yards in the Southern Section.

According to the provisional geological sketch map of Viti Levu prepared by Mr. F. T. M. White, of the Mines Department, the flat lands of the Station are related geologically to the Alluvial Series and the hill soils overlie the Koroyanitu Series of andesites and volcanic plugs. Mr. White has informed the writer that more recent work has shown that the extensive Koroyanitu Series which comprises almost one-half of Viti Levu will have to be subdivided and that the volcanic rocks from which the hill soils have been developed are more basic than is normal for the series.

For agricultural purposes the Station is divided into Northern, Central and Southern Sections, and the purpose, policy and layout has been described by H. W. Jack (1) who developed the Station. The work of the Station has been seriously affected by the war which occurred soon after its establishment; nevertheless much useful information has already been secured and the foundation laid for future investigations.

A reconnaissance soil survey was made of the area in 1939 and soil samples were taken for laboratory examination. Owing to staff shortages and increasing war duties it was not found possible to complete the laboratory investigations until quite recently. The following account of the soils deals more particularly with the cultivated alluvials and includes a brief field reference to the hill soils.

FIELD NOTES.

Since it is the intention to include the field notes on a detailed soil map of the Station for Station use, brief references of a general pedological nature will suffice for the purpose of this paper.

Three traverses were made across the Station at positions designed to give sufficient detail for a map of four chains to the inch.

The first traverse line commenced at the *bure* on the slopes below plot 101 on a magnetic bearing of 2° and ended at the mango tree on block 56. This traverse covered plots 89 to 80 inclusive.

The direction of traverse which was altered at this point to a magnetic bearing of 185°, covered the main portion of the Central flats, observations being made in plots 42, 32, 31 and the new nursery area plot 19.

The second traverse started from the bottom of the steps leading to the Station Office from the Government Road, in the Northern Division, and with a magnetic bearing of 192° the distance to the mango tree on plot 56 was passed over, field observations being made on plots 8 to 18, 44, 46, 50 and 53.

A small traverse was made up the ridge from the *bure* position at the commencement of the first traverse at a bearing of 178° and special observtions were made on rotation plots 2 to 7, the new nursery area, plots 19 and 31, citrus orchard block, the new 5-acres plots (Matovo), plot 41 (as representative of the swamp land suitable for wet land rice) and plots 76 to 80.

Since the Station is still subject to occasional flooding of short duration, as indicated by its almost complete submergence in 1939, complex patterns have not developed in the manner usual with soil generated from undisturbed alluvium not subject to flood accretions; accordingly the soils are almost completely defined by the nature of the alluvium and even in the higher portions close to the river there is little evidence of profile development. Soil texture varies somewhat across the flats but not in a manner sufficient

to distinguish separate soil types in the pedogenic sense. It is preferable to consider such variation as of geologic origin constituting a phasic difference due to flooding and relief.

The main soil type, comprising about 90 per cent of the arable land, is a greyish brown to dark brown silty-clay-loam possessing in general a small clod structure after turning with the plough, somewhat compacted in situ, internal drainage being fair to good and the profile undifferentiated. In plots 44 and 46 the general picture is altered somewhat by a surface deposition of some two to three inches of sand and in the Central Area of plot 19, nine inches to one foot of silty gravel overlies the normal alluvium.

The surface of plot 41, typical of the wet land rice area, had a tessellated appearance and the soil was brown black in colour with a clay-loam texture somewhat compacted but breaking down to a good crumb on working. The soil was wet with the water table at approximately two feet. Weathered clay-like material from adjacent hills occurred throughout the profile which was undeveloped. Similarly, plots 76 to 80 showed reddish brown inclusions of weathered hillside material, but internal and external drainage conditions were more satisfactory than with plot 41.

A typical hillside profile taken on a slope of 25° displayed a soil depth of some four inches to five inches of dark brown sandy-loam of good crumb structure lying directly on the " C " horizon (parent material). The profile was very immature with no superficial evidence of differentiation. The parent material consisted of andesite.

LABORATORY OBSERVATIONS.

The mechanical analysis, pH, total exchangeable bases, exchangeable calcium, available P_2O_5 and the lime requirement were determined on 19 soils taken during the survey of the Station; the data are included in Table 2.

TABLE 2.

Soil No.	Plot.	C.S. %	F.S. %	Silt %	Clay %	pH	Ex. Bases	Ex. Cal.	P_2O_5	Lime requirement
421	31	16·44	22·88	31·69	28·88	7·44	20·0	15·1	100	0·33
422	Hill	34·80	24·45	28·19	12·20	7·67	14·5	11·2	226	0·15
423	19	0·97	26·22	43·38	29·44	6·07	14·6	8·7	980	1·07
425	Orchard	48·49	26·45	15·20	10·12	7·12	10·1	4·5	64	0·10
426	56	4·74	52·84	20·96	21·42	6·29	16·1	13·1	226	0·19
428	4	0·26	29·63	49·33	20·85	6·37	18·2	13·8	800	0·41
436	1st 9″ 77	7·44	22·56	41·36	28·63	6·93	19·1	15·6	360	0·44
429	2nd 9″ 77	4·80	19·26	47·98	28·55	7·14	19·3	14·3	500	0·14
431	53	0·67	23·44	49·55	26·33	7·21	21·1	18·2	989	0·21
432	102	3·11	15·61	51·52	28·97	6·54	23·1	19·7	480	0·19
435	1st 9″ 41	4·21	18·60	47·13	29·34	6·78	21·4	13·5	65	0·58
433	2nd 9″ 41	6·09	19·05	48·52	26·73	7·21	15·0	9·7	64	0·24
434	5 acre plot	10·13	40·58	33·30	15·98	6·99	17·5	13·7	475	0·39
438	1st 9″ 86	0·27	17·34	53·46	28·96	6·53	21·1	17·2	250	0·51
439	2nd 9″ 86	25·41	22·68	28·38	23·60	7·10	9·6	4·1	100	0·44
440	10	1·14	36·74	36·87	25·24	6·54	23·1	19·7	480	0·19
441	2nd 9″ 5 ac. plot ..	9·26	46·45	23·43	20·84	6·87	14·0	10·4	200	0·34
447	14	0·40	24·55	47·70	27·34	6·76	21·1	17·5	276	0·10
448	44	0·55	27·48	43·63	28·32	6·84	18·2	18·0	220	0·22

NOTES.

Exchangeable Bases in milligram equivalent per 100 grams of soil.
P_2O_5 = available P_2O_5 in parts per million.
Lime requirements in tons per acre of $CaCO_3$ (per acre furrow slice = 2 x 106 lb).
C.S. = Coarse sand. F.S. = fine sand. Ex. Cal. = Exchangable calcium.

The mechanical analysis was carried out by the beaker sedimentation method; pH by the electrometric quinhydrone method; exchangeable bases by the Rice Williams' technique; available P_2O_5 by the Truog method and the lime requirement by the Hutchinson and Maclennan method.

The mechanical analysis supports the filed evidence of the "heaviness" of the main soil type of the alluvial flat and indicates areas of lighter soils in plots 36, the 5-acre plot (Matovo) the orchard plot and plot 10. The available P_2O_5 is generally excellent and can be attributed to the low acidity and excellent base exchange status of the soils. With the exception of soil 423 the average lime requirement is a little less than 4 cwt. per acre.

In the light of the low acidity and excellent base exchange status it would be inadvisable to lime these soils heavily in order to lighten them. The P_2O_5 is in a readily available condition and heavy liming might lead to excessive loss in the drainage water. It would be preferable to lighten by tillage and green manure crops and maintain the already excellent faintly acid to neutral condition by small dressings of coral sand at the appropriate season.

The Sigatoka alluvials are, in general, heavier than the Rewa alluvials and are much superior from an agricultural standpoint. With careful management these soils can be numbered among the best agricultural soils of the Colony.

I am indebted to Mr. G. F. Flemons, A.I.C., for assistance with the field work, and Mr. E. Wright, also to Corporal Collins of the U.S. Forces Chemical Company for assistance with the laboratory work.

REFERENCE.

(1) Jack, H. W.—1939 *Agricultural Journal*, Fiji, Vol. 10, No. 3.

SOIL CONSERVATION.

By
H. W. JACK, O.B.E., B.A., D.Sc.,
Director of Agriculture.

Soil is the mother of all forms of life—plants, animals and men. Everything that our bodies require with the exception of air and sunlight comes from the soil. Nature has been kind to the soil but man has been rude. He overcuts the timber land, overstocks the pasture land and overcrops the cropping land. He pours fertility, year after year, into the cities, which in turn, pour what they do not use into the rivers and the ocean. Through ignorance and carelessness man has destroyed millions of acres of good land(1).

Soil is more than a chance mixture of rock material and organic matter, it is a product of action and reaction of minerals, biological activities, climate and time. It is dynamic and ever changing. Under natural conditions the rate of soil formation slightly exceeds that of soil erosion and as a result soil is formed. Under thoughtless management by man, soil is often rendered structureless, arid, leached, lifeless and finally wasted bodily away(2).

Fortunately, man has finally awakened to the evils and injustice done to the soil and research has opened up means of applying remedies to combat soil erosion, which in wet zones is fundamentally due to the impermeability of the water-shed.

The maintenance of the fertility of the soil is the first condition of any permanent system of agriculture. Ordinary processes of crop production tend to reduce fertility steadily so that the continuous restoration of fertility by means of soil management and manuring is imperative.

Under natural conditions fertility is maintained because such conditions do not allow of any semblance of monoculture, mixed crops and mixed farming are the rule—plants and animals thrive together ; the soil is never exposed to sun, wind or rain, rainfall is carefully conserved in the vegetation and humus of the soils which are continuously manured by the accumulation of animal and vegetable residues : these in turn are converted by fungi and bacteria into available plant foods(3).

Under ancient forms of cultivations such as the " staircase " cultivation of old Peru, or under oriental terraced and irrigated lands such as are found in the mountainous regions of China, Japan, Java, Ceylon etc., care was taken to conserve fertility by mixed farming methods and fertility has been maintained(4).

Under more modern methods of cultivation, monoculture is the rule, the machine has replaced animal traction, artificial manures are widely used, the value of green manuring is ignored and the NPK* mentality tends to dominate farming in all its branches so that soil fertility tends to diminish while crop pests appear to be increasing so that science has to be called in to indicate suitable remedies.

In addition, the increasing competition for land has led to the use of steep lands for arable purposes with the result that soil erosion has tended to increase in many countries and is now evident in many areas even in Fiji where land is still abundant.

In the Fiji *Agricultural Journal* in 1937 attention was directed to the importance of the problem of soil erosion in Fiji. This article indicated the main factors affecting the rate of erosion and mentioned the better known methods for counteracting resultant soil losses. It also pointed out the need for watchfulness to stem the progress of soil erosion and of education to stimulate farmers to practise sound methods of soil conservation so as to ensure the establishment of a permanent and contented peasantry(5).

In the pages of the same journal in 1 39 mention was again made of the effects of soil erosion, the chief measures adopted to control it and the need to put such measures into practice in Fiji, although erosion had not yet attained serious proportions(6).

Just before the outbreak of war, efforts were made by the Department of Agriculture to initiate soil conservation work in the Colony.

Necessary steps were taken to train subordinate staff in contour work, to provide ocular demonstration of control measures and to awaken the interest of small farmers.

Simple levels were provided and instructions were issued for the thorough training of all subordinate field staff in their use and some demonstration farms and school farms were contoured. Plans were made for the maintenance of such work on a five year plan with the ultimate objective that all small farmers would have heard of soil erosion control and preferably have seen it for themselves.

The simple apparatus used included striding levels, inverted T levels and U tube levels, road tracers, while senior officers also used an Abney level for work where greater accuracy was required.

Areas on which soil erosion control measures were taken include the rice-fields at the General Experiment Station, Sigatoka, which now afford a useful and striking demonstration, the hill plots yielding excellent crops of rice in the present season.

The model farm area of the Central Agricultural Station, Naduruloulou, where a series of bench terraces was constructed and where all permanent crops, mainly citrus, were planted on the contours also provides an excellent example of such work.

The whole of the arable land on the Dobuilevu Sub-station near Ra was contoured, hedges of vetiver grass, bananas, pineapples, etc., being planted on the contour margins and now forms a satisfactory demonstration which should have a useful ultimate influence on the farmers living on the adjacent Indian and Fijian settlements.

The grounds of the Provincial School, Kadavu, on account of their steepness, were laid out to demonstrate strip cropping as well as other methods. The Headmaster maintained the work enthusiastically so that striking results have been achieved and the cultivated contoured plots located between wide strips of grass and bush are fertile and productive compared with surrounding untreated land.

Several other areas and school farms were also laid out on the contours but the advent of war and the acute shortage of labour led to their neglect and, in many cases, complete abandonment so that they have not achieved the effective results that are in evidence at the locations indicated in the previous paragraphs. It is unfortunate that war obliterated promising soil conservation demonstration measures in several areas but enough has been mentioned to show that a planned start was made along right lines and it is hoped that it will soon again become possible to recommence this valuable and necessary work.

In addition to the demonstrations already mentioned, propaganda leaflets were printed in Fijian and Hindi, giving advice on simple soil erosion control measures, and widely distributed to small farmers.

More recently the destructive nature of the indiscriminate firing of grass and reed lands is causing soil erosion, particularly in the dry zones on land cultivated by Indians, has not been given attention.

Brief notices portraying the evils of fire in damaging fertile soil were prepared in co-operation with the Conservator of Forests, printed in Hindi and Fijian and given as wide a distribution as possible. Instructions were also issued that these notices should be given full publicity amongst Fijians and Indians by all practicable means, including readings at Native Councils, schools, and other gatherings.

By these means and by ocular demonstrations it is hoped that natives and Indians will gradually become conscious of the cumulative detrimental effects of fires on the fertility of the land and the great losses which they cause to the timber resources of the Colony, particularly in dry zones.

Another major cause of soil erosion is the system of agriculture followed by many Indian farmers of cultivating one piece of land until it is so exhausted of fertility as to be unremunerative. It is then abandoned and the process is commenced anew on another area of land so that considerable areas of once fertile soil will, in time, pass out of cultivation unless farmers can be induced to adopt conservation measures. It is hoped that it may be possible to arrange for properly equipped soil conservation units (tractors, delvers, scoops, etc.) to carry out large scale demonstrations after

the war in the areas where they are most necessary with a view ultimately to the use of such equipment by the farmers themselves at a reasonable rental.

While little damage from soil erosion occurs in the alluvial flat lands of the Colony sheet erosion is taking place on the undulating and high lands and hence it is necessary to draw attention to the need for the general adoption of further measures of conservation since the maintenance of soil fertility is vital to progress and national health.

Accordingly, these brief notes are designed with the object of gradually awaking public interest in a highly important matter which merits serious consideration in the development of the Colony. It is, therefore, hoped that these notes may help towards preparing the way for an intensive campaign in soil erosion control methods as soon as circumstances permit.

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(4) Grasovsky, A.—1938 Imperial Forestry Institute, Paper No. 14, Oxford.
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*These letters stand respectively for nitrogen, phosphorus and potash, the so-called "complete" plant food. K is derived from the initial letter of the Latin word for potash, kalium. —Editor, *Agricultural Journal.*

MAIZE SEED SELECTION.

By

C. M. DASS, Agricultural Instructor.

SEED selection is of prime importance in agriculture. Good crops cannot be produced even on first class land if poor seed is used. Successful farming requires fertile soil, optimum climatic conditions and good seed.

Maize is grown universally in Fiji. The peasant farmer, who grows most of it, is acquainted with its production and preparation for market but in practice he does not give due consideration to two important points, namely, suitable rotation and seed selection. The second point only is dealt with in these notes.

It is estimated that the average yield per acre of the maize crop in the Sigatoka District is under 30 bushels. The aim of all growers should be to produce crops of between 40 and 60 bushels per acre and one of the ways it may be done is through seed selection.

The variety of maize commonly grown and found most suitable by experience for Fiji conditions is Yellow Flint. This variety, though not pure as found growing in this country, is fairly uniform in plant habit and maturation period, taking about five months from planting to harvesting. It normally produces one ear per plant, but in every field plants may be noticed bearing two normal ears each. It is reasonable to expect an increased yield if the proportion of plants producing two normal ears each could be increased. This may be attained through seed selection.

It is known that some of the more progressive growers select cobs from which to draw their seed supply, but few, if any, select plants from which to obtain their seed. Maize selection should be done both in the field and in the barn in order to obtain the desired results.

SELECTION IN THE FIELD.

In the field, due consideration should be given to the plants from which the ears are to be selected. An unusually vigorous plant bearing a large ear may be due to the fact that it has more growing space than its neighbours, or it may be growing on a particularly rich spot in the field, or it may have access to more moisture than other plants growing in its vicinity. It is not wise to select such a plant, because seed obtained from it cannot in turn give rise to plants which will produce as abundantly as the mother plant unless given given similar advantageous growing conditions.

The following procedure may be adopted in field selection:—

(1) Select plants of good or moderate size which grow under normal or even adverse conditions in the field.

(2) Aim to select maize from plants bearing two ears, one of which at least is of normal size.

(3) Plants which produce large ears in comparison with size of stalk should form the basis of selection.

(4) The ears should be borne at a convenient height on the stalk, that is, four to five feet from the ground. This is essential in tall varieties in order to render picking easy.

(5) Select ears which are completely and tightly covered with husk as this protects the grains from rain and the corn ear worm.

(6) Select ears which turn down at maturity as this provides protection to the grains from rain.

(7) Do not select ears from plants which are blown down or broken down, no matter how good the ears may be. Such plants indicate weak stems, the causes of which may be root or stalk rot and these diseases may be transmitted through the seed.

Selected plants should be marked and picked separately. After drying the ears thoroughly in the sun they should be tied together into small bundles by means of a portion of the husk left attached to them for the purpose, and hung in a dry place until required. Periodical inspections need to be made to safeguard against attack by weevils, rats and other pests,

SELECTION IN THE BARN.

The second selection is done in the barn before planting. The following points should be noted:—

(1) Select cobs containing sound, heavy, plump grains of good, bright colour.

(2) Reject cobs containing dented or pinched grains.

(3) Select cobs of average size, typical of the variety which, when dry, are heavy in proportion to their size.

(4) Select cobs containing straight rows of grains packed tightly up to the tip.

(5) Reject cobs showing split, mouldy or darkened grains.

(6) Aim to secure uniformity in size, shape and appearance of cobs and grains.

If small quantities of seed are required for planting, the cobs are best shelled by hand. Before doing this, cut off and discard about one inch from either end of the cobs, for seeds borne at the ends are irregular in size and shape.

CULLING OF DAIRY HERDS FROM FACTS.

By
J. J. C. SUCKLING, Dip. Dairying (Massey College), Agricultural Assistant.

DAIRYING in Fiji, particularly those aspects of housing and feeding of animals, requires probably less human effort than in any other country in the world. The net result of this single factor has been the acceptance of methods of production, which while they have contributed to some measure of success, have not called for progressive development.

Production measured in pounds of butterfat per head or per acre is low compared with figures recorded in more temperate countries. Stutchbery in his report on the progress of the dairying industry in Fiji (1) drew attention to the fact that of 556 cows tested, only 30 produced more than 50 lbs. of butterfat in 30 days, while only 116 cows gave more than 30 lbs in the period. This low production however, has been off-set by the availability of cheap labour and cheap land. These are the real reasons why dairying has enabled a living to be earned and profits to be made in spite of the low production per animal.

With the steady increase in wages demanded by milkers, plus other rising costs of production, the question of improving the herd takes on a new importance, for it is becoming more evident each month that animals not attaining to a certain standard are a sheer drain on the farm. Just how severe the standard of culling indicated will have to be determined by the owner himself, insomuch as the demands of wages and other costs vary in different localities. The fact remains that culling is necessary and to-day the dairyman is assured of the best prices in the history of the Colony for his culls as beef, provided a permit is procured from the Veterinary Division.

The question of which cows should be culled is of great importance. Obviously first, all animals with visible undesirable characteristics such as very low milk producers, nervous and temperamental animals, bad breeders, difficult milkers, aged cows and cows conforming to bad type. Stock in the above category will never pay for their keep, yet almost every herd has a number of undesirable cows which waste the time of a milkman twice a day for seven months of the year—fifty hours during the lactation period, a matter of increasing moment now that labour costs are mounting to a sizable figure.

The Veterinary Officer will indicate which cows are infected with tuberculosis, and this is the most unfortunate aspect of culling, as the disease is not confined to low producers. Too often, the best milkers react to the test. However, the prevalence of tuberculosis in parts of Fiji is surely an indication that the tuberculin testing of cattle should be extended to all dairy herds. There is nothing for it, if testing is decided upon, but to dispose of the tubercular cows in a first culling.

Herd-testing in Tailevu has never been undertaken regularly though there are individual dairymen who have had tests made from time to time. The Navua herds are regularly tested and the results found well worth while.

Experience shows that the quantity of milk produced is not the sole indication of the butterfat-yielding value of the cow, so that if culling is to be undertaken on a businesslike basis, herd testing as a regular feature of dairying must be adopted. From the point of view of culling alone, testing for production of individual cows pays handsomely, but the real value lies in less immediately discernable factors such as the checking of the value of the bull and his influence on the butterfat-yielding qualities of his daughters. It would be fairly safe to state that in many herds the first animal to cull would be the bull, but until the production of his daughters can be measured against that of the dams no farmer can be sure that his herd is not being steadily damaged by an

inferior sire. Testing eliminates this doubt. Similarly testing enables the farmer to select for breeding purposes only such cows as will increase the production of the herd.

Most dairymen are familiar with the principles of testing which consist in determining the approximate yield of butterfat of each cow in the herd. The quantity of milk is arrived at by simple weighing in the shed and the percentage of butterfat (test) computed by analysis. For practical purposes it has been shown that cows tested at 30 day intervals throughout their lactation give a figure of sufficient accuracy provided that care is taken to assure that the milk and shed conditions are as near normal at the time of sampling as possible.

There are many systems of testing, but the one most likely to suit Fiji conditions is known as the "Own-sample" method where the farmer samples and weighs each cow's milk once in each period. The samples are tested for fat at home or preservatized and sent to the factory or the chemist. The results are recorded as follows:—

Milk for the period is calculated by multiplying the one day's weight by 30. (At the commencement and termination of lactation the day's weight is obviously multiplied by the actual number of days in milk).

Fat for the period is calculated by multiplying the period milk by the test divided by 100.

Yield for the season is ascertained by totalling the pounds butterfat in each period.

With the information thus obtained, the best of the herd can readily be segregated from the wasters and this with no element of guesswork whatsoever. The farmer knows when he disposes of culls to the butcher that only the lowest producers in his herd are going. Without testing he merely assumes that such is the case. Even if culling in wartime is going to result in a small drop in total production, the saving in time and labour together with the increased availability of pasture for those stock which do earn their keep, will tend to bring up the net return, while as mentioned before, the price of beef which these culls now demand will give a handsome return. Such money can be put towards the cost of good quality animals from Australia or New Zealand when hostilities cease.

(1) Stutchbery, H.M. 1930—"Progress of the Dairying Industry in Fiji". *Agric. Journ.*, Fiji. Vol. 3, No. 1, p. 18.

EXTRACT.

MODERN NEBUCHADNEZZAR.

THE ability of goats, burros*, and other animals to digest cellulose has long amazed me. A burro will leave oats to eat a wagon box. Some time ago it was predicted that chemists would either so modify cellulose as to make it digestible by man or else they would discover the reason a goat can grow fat on paper, and confer those same properties on humans. Partial hydrolysis of cellulose so that it can be utilized as a stock food and even by man has long ago been accomplished, but recently Dr. Gustav Martin reported that he had produced a chocolate-flavoured syrup containing certain germ cultures which, if taken by human beings, would properly modify the intestinal flora and confer on us for life the digestive powers normally possessed by the goat. Then we, too, could digest leaves, grass, and even wood. Dr. Martin assured us that the cost of this treatment would not be more than two dollars.

—*Rotarian*, January, 1944.

*A hardy donkey used as a pack animal.—Editor, *Agric. Journal.*

FURTHER NOTES ON RICE VARIETIES.

Compiled by D. A. DONALD, Agricultural Officer, Western.

EXPERIMENTAL work at the General Experiment Station, Sigatoka, has had to be severely curtailed during the war years owing to the necessity of using the Station resources for the production of vegetable seeds and crops for food for the military forces and also to considerable labour difficulties. One of the few investigations that has been maintained on a restricted basis is the study of local rice varieties.

The General Experiment Station is administered locally by the Agricultural Officer, Western; the resident Officer in Charge is Mr. C. R. Vasey, Agricultural Assistant, and the experimentalist is Mr. C. M. Dass, Field Assistant, who wrote preliminary notes in the *Journal* for September 1942.

The results show that only one variety, Karia (1), is significantly inferior to the standard variety China Patna. There is however considerable difference in yield between the first variety—New Guinea—and the fifteenth —Karia (2), even though they are not significantly separable. The experiment will have to be repeated for three or four more seasons before the results are experimentally satisfactory and it is hoped that staff, labour, finance, and war conditions will soon permit of extensive work with single plant selections.

The multiplication of pure line seed from approved selections would enable the clearing up of the very involved rice variety nomenclature that now exists. Some of the popular names of varieties and their synonyms which have been located may be of interest to local growers. Much remains to be done in the classification of local rices and the urgency of the work is realized.

NOMENCLATURE OF RICE VARIETIES.

Popular name.	*Synonyms.*
Sonacalif	Sona or Sonawa.
China Patna	Lakarahawa.
Gazi	Chetwa.
Ram Bhog	.....
Ban Dala	Lautoka, Motka, Lal Dhan, Badilla, Lalka or China Motka.
Karia	Bagari.
Patarka	Mehi (White Plant)
China Patarka	Suji or Mehi (Red Plant).
Motka	Table (pronounced "Tibble"), China or Bandala.
Patna	.....
Saraya	.....
Mutmuria	.....
Suji	.....
Saraya Patna	Lalka, Lalka Sarya.
Bandala ka Bachha	.....
Bichua	.....
Java	.....
Jadhan	.....
New Guinea	.....
Ram Cajara	.....
B.G. 75	.....
B.G. 79	British Guiana.
D. 116	.....
Bara Masi	Baramasia.
Basmati	Basmatia.

Rice Variety Trial at General Experiment Station 1942/43.

Sixteen of the most promising varieties were selected for trial and grown in randomized plots replicated four times, thus giving a total of 64 plots. This was done by the Field Assistant who is charge of the investigations.

Seed was sown in nurseries in November 1942 and the seedlings were planted out in January 1943 under rather dry conditions. Sufficient rain fell from February to May to encourage good growth in portions of the field. The crop was harvested in May, with the exception of China Patna which was harvested in June.

Results obtained are shown below:—

TABLE 1.

No.	Variety.	Serial No.	Maturation Period.		Mean yield per acre.	
			(1) 1942/43.	(2) Average, for 3 years.		
			days.	days.	lb	cwt.
1	New Guinea	37	168	197	4,843	43·2
2	Sarya (2)	61	168	185	4,736	42·2
3	B.G. 79	40	168	188	4,421	39·5
4	Table Rice	55	180	188	4,031	36·0
5	Patarka	7	174	185	4,000	35·7
6	Ram Bhog	4	174	186	3,986	35·6
7	China Patna	2	188	192	3,843	34·3
8	Motmuria	33	156	180	3,781	33·8
9	Ram Cajara	41	180	193	3,703	33·1
10	B.G. 75	39	169	184	3,578	31·9
11	Patna	16	180	188	3,453	30·8
12	Saraya (1)	22	180	191	3,270	29·2
13	Bichua	52	174	185	3,109	27·7
14	China Patarka	17	169	184	2,921	26·1
15	Karia (2)	50	180	188	2,859	25·5
16	Karia (1)	6	180	181	2,250	20·0

TABLE 2.

Varieties in Order of Merit.	Mean yield.	Yields compared to Standard Varieties.
	cwt.	
(37) New Guinea. .. 1	43·2 ± 4·86	125·9
(61) Sarya (2) 2	42·2 ± 4·86	123·0
(40) B.G. 79 3	39·5 ± 4·86	115·2
(55) Table Rice . .. 4	36·0 ± 4·86	105·0
(7) Patarka 5	35·7 ± 4·86	104·1
(4) Ram Bhog . .. 6	35·6 ± 4·86	103·8
(2) China Patna .. 7	34·3 ± 4·86	100·0
(33) Motmuria 8	33·8 ± 4·86	98·5
(41) Ram Cajara .. 9	33·1 ± 4·86	96·5
(39) B.G. 75 10	31·9 ± 4·86	93·0
(16) Patna 11	30·8 ± 4·86	89·8
(22) Saraya (1) 12	29·2 ± 4·86	85·2
(52) Bichua 13	27·7 ± 4·86	80·8
(17) China Patarka .. 14	26·1 ± 4·86	76·1
(50) Karia (2) 15	25·5 ± 4·86	74·3
(6) Karia (1) 16	20·0 ± 4·86	58·3

Significant difference = 13·6 cwt.

Using R. A. Fisher's analysis of variance, the significant difference for this experiment was found to be 13·6 cwt. Applying these data, variety Karia (1) (Serial No. 6), is significantly inferior to the standard variety, China Patna, while the other varieties are not significantly separable, see Table 2.

Shattering was very heavy (estimated at 30 per cent) in both varieties of Karia while lodging occurred more or less severely in all varieties except China Patna and New Guinea.

Varieties B.G. 79 and Sarya (61) lack uniformity in size and shape of grain, the last-mentioned also contains red rice.

An interesting fact observed was that though the rainfall during the growing period in season 1942/43 was 14·38 inches in excess of that for the previous three seasons, the maturation period was thirteen days less.

ANALYSIS OF VARIANCE.

Variance due to	Degrees of freedom.	Sum of squares.	Variance or mean sq.
Blocks	3	576·32 (2)	192·11
Varieties	15	2304·11 (3)	153·61
Error	45	4252·35 (4)	94·50
Total ..	63	7132·78 (1)	

Standard error for whole experiment $\sqrt{\frac{94·5}{4}} = \sqrt{23·62} = 4·86$

Standard error = 4·86 cwt. per acre.

Percentage error $\frac{4·86 \times 22 \times 100}{43·2} = 15·89$ per cent.

The standard variety for the purpose of this experiment is China Patna

ENTOMOLOGICAL NOTES.

By
R. J. A. W. LEVER, B.Sc., D.I.C., A.I.C.T.A., F.L.S.,
Entomologist.

1. FRUIT FLIES AND THEIR PARASITES.

In the March issue of the *Journal* (p. 16) larval parasites of *Notodacus xanthodes* Broun, and *Chaetodacus passiflorae* Frogg. in breadfruit were briefly referred to. Through the kindess of Dr. C. F. W. Meusebeck of the Bureau of Entomology and Plant Quarantine, Washington, the Braconid mentioned as *Biosteres tryoni* Cam. is said to be better referred to as *Opius tryoni* Cam., probably a new variety. This reopens the question of *O. fijiensis* Fullaway taken in 1936 at Nasinu (deciphered from Mr. Simmonds's label as "Naoinee") no host being recorded.(1)

The only other parasite so far indentified is *Melittobia indica* Silv. introduced for control of these fruit flies in March 1938 : its recovery from Sarcophagid pupae in 1942 was referred to last year(2)

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2. THE FILARIAL MOSQUITO, *AEDES SCUTELLARIS PSEUDOSCUTELLARIS*.

Aëdes scutellaris Wlk. *pseudoscutellaris* Theo. is the common semi-domestic day-biting mosquito breeding chiefly in rot holes in trees, split coconut shells, other artificial containers (tins, bottles, wooden drums etc.) and leaf axils of dalo or taro (*Colocasia*). There is no particular value in recording full details of all the species of trees selected (mango, ivi or *Inocarpus edulis* Forst., vavai or *Serianthes* spp., *Laportea* or saloto, dilo or *Calophyllum inophyllum* L. being perhaps the most common) but it is of interest to record it breeding in February 1944 in leaf axils of the wild ginger *Alpinia boia* Seem., the specific name being also the Fijian one. A more recent record was in the fallen, broken gourd-like shells of the introduced calabash (*Crescentia cujete* L.) in one case there being no water in the cavity but only a mass of damp leaf mould in which the larvae pupated.

Considerable work in Fiji has been carried out already with this mosquito as it was incriminated (1) by Dr. (now Sir Patrick Manson)—Bahr, in 1910 as the most efficient vector of non-periodic filariasis in Fiji. This holds good also for the Ellice Islands and Union Group (Tokelau) as shown by O'Connor (2) and for Samoa by Buxton (3). The latter made most detailed studies and both these workers found coconut shells and husks, small tins and rot holes to be the favoured sites for egg laying ; Buxton, not finding any larvae in taro axils though recorded there by Paine (4) in Fiji.

In his observations on the habits of *A. scutellaris pseudoscutellaris*, Bahr refers to its abundance on Mosquito Island or Nukumaroriko where there are no pools of fresh water. To-day this small island of 2¼ acres has apparently undergone a good deal of felling since 1910 but it was still easy in April 1944 to catch in a collecting tube four females feeding simultaneously on one's arm. Rot holes in vesi (*Intsia bijuga* A. Gray) and vutu (*Barringtonia speciosa*) were sites where larvae were found by the writer; no split coconuts were seen. As a matter of interest, flights of the common dragonfly, *Diplacodes trivialis* Ramb., were seen on this small waterless island about 250 yards from the mainland.

To conclude with another reference to the medical importance of this mosquito it is interesting to record that recent research by Army medical units directed suspicion in 1943 to this mosquito as being a dengue vector in New Guinea and this also seems to be the case in Fiji as during the months of August to October in certain parts of Suva, and even more so early in December at the height of the epidemic at Nadi, *pseudoscutellaris* was more abundant than the strictly domestic *aegypti* which was actually scarce. Normally dengue is clearly associated with *aegypti* L., certainly in Australia (5), and the spread of both filariasis and dengue by this semi-domestic species would mean the need for greater vigilance in preventing its breeding in rot holes, tins, bottles, coconut shells and rain gutters i.e. both urban and rural sites.

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3. ON THE BREEDING PLACES OF SOME LOCAL MOSQUITOES.

PREVIOUS articles have dealt with some of the obvious and typical places which mosquitoes choose for egg laying such as drains, swamps, puddles, streams and containers ranging from native *lalis* and canoes to the common tins, jars, bottles, coconut shells, drums and tanks.

Some frequently overlooked places are old tyres either left abandoned in long grass in back gardens and waste land, or utilized as borders for smaller flower beds. A search in these places often results in finding larvae of the usual dengue mosquito *Aëdes aegypti* L. and less frequently of *A. scutellaris* Wlk., *pseudoscutellaris* Theo.

Decrepit cars, particularly their discarded mudguards, frequently have enough water for mosquito breeding though such sites are often not recognized to exist. This also applies to the ornamental clam shells so generally placed along flower beds or near front porches.

Normally careful gardeners, who rarely leave even paint tins or split coconuts around, sometimes offend by overlooking diluted fowl manure in a tin which before it is needed again has given rise to a mass of larval *Culex fatigans* Wied., *A. aegypti* L. or perhaps a mixed colony of these two species. The former is very prone to shelter at night in cars which have not been closed up and such resting mosquitoes may thus be carried for miles when the car is driven off next morning. *C. fatigans* often shelters similarly in soapstone air raid shelters even when there is no water on the ground. The attraction to pit privies by this species is well known and breeding can to some extent be checked by replacing the cover; as shown previously (1) *C. fatigans* is greatly attracted to water polluted with organic matter. Another water place chosen is in the hollow under the Indian rice mortars or *dheki*.

The night-biting *Culex annulirostris* Skuse, so common in rice fields, swamps, ponds, pools, drains and ditches was found at Kalabo last March breeding in isolated rock pools near a waterfall. As it also lays eggs in barrels and tins it has a very wide range of water places, both urban and rural.

In editing last year a revised edition of Paine's 1935 bulletin (2), the writer followed the usually accepted name for " via " viz. *Alocasia indica* Schott. Having, however, reason to suspect the identification, specimens of leaves were sent to Dr. H. St. John, Professor of Botany, University of Hawaii, who kindly identified our " via " as *A. macrorrhiza* (L.) Schott, this being the common species in most Pacific islands. It is in the leaf axils of this plant that one finds larvae of *Uranotænia colocasiæ* Edw. and *Aëdes kochi* Don., though the latter prefers *Pandanus* axils. See previous Note on *A. scutellaris*.

There is one race of mosquitoes peculiar to Fiji, viz. *Aëdes scutellaris horrescens* Edw., which the writer recently found breeding in tree holes of " vutu " (*Barringtonia speciosa*) on Mosquito Island (Nukumaroriko) one hole having only damp leaf mould without a drop of collectable water in it. This jungle species was discovered by Paine (2) as recently as 1935; the adults are difficult to distinguish from *pseudoscutellaris* without dissection. Paine (3) suggested to Dr. Edwards it may not be present on Viti Levu but it is, occurring even in Suva.

The algal-loving larvae of *Culex albinervis* Edw. has been taken recently in the Wainimala River at Vunidawa, the first actual record from the interior of the island of Viti Levu. The sites were along the edge of the river and in a pebbly pond which had clearly been recently cut off from the river. During the course of breeding this mosquito in Suva the writer found a well-marked colour variety with silvery thorax in place of the usual

dark brown; the colour is easily seen by the naked eye. In Edwards' original description(4) he referred to "entirely pure white scales" on the thorax in two females but these also occur in the male.

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(3) Edwards, F. W. 1935.—*Bull. Ent. Rsch.* Vol. 26, June, p. 129.
(4) Ibid., 1929. Vol. 20, p. 338.

4. THE CUT WORM *PRODENIA LITURA* F. AND ITS PARASITES.

Since publication of the writer's article on *Prodenia litura* which appeared, without any author's name, in the *Journal* for March 1943 (Vol. 14, No.1) more food plants have been recorded, viz. the spiny noxious weed *Solanum torvum* Sw., banana and garden pea. This *Solanum* is a close ally of the egg plant or brinjal which is also attacked, *Prodenia* then being a pest but on the harmful *S. torvum* it is beneficial. Peas were defoliated as seedlings in July and August 1943 unless the larvae were collected by hand within a few days of the expansion of the true (non-cotyledonous) leaves.

Larval parasites are *Apanteles* sp. and *Euplectrus* sp. the latter taken in December 1943 confirming the tentative record mentioned in the 1943 article. The solitary instance of the damage to bananas was caused by the larva eating the unrolled leaf so as to form a series of regularly spaced holes in the leaf when expanded. Ornamental plants such as *Zinnias* also suffer some damage.

5. BANANA BEETLES.

In an issue of this *Journal* for 1940 (1) mention was made of the useful predaceous beetle *Plaesius javanus* Erich, which was shown to be increasing in Tahiti whence it was introduced from Fiji in 1937 to control the banana borer *Cosmopolites sordidus* Chevr.

Since then the writer has been informed by a gentleman who has lived for years in Tahiti that the local banana or fei (*Musa fehi* Bert.) is now growing much more vigorously in the island than before *Plaesius* was introduced seven years ago. Details are known of one isolated locality on the northern coast of Tahiti where only 18 specimens of this useful beetle were liberated; last December no less than 11 were taken in this area in a quarter of an hour and one hundred a few days later.

As a matter of interest, arrangements were under way in 1941 to get from Malaya a consignment of another beetle (*Dactylosternum hydrophiloides* Mcleary), also a predator of *Cosmopolites*. The last official letter written in December 1941 from Kuala Lumpur agreed to the dispatch of this beetle but consequent on the Japanese aggression the scheme had to be abandoned but may be renewed after the return to normal conditions in the Far East.

On banana stems in Fiji there is also the small weevil *Polytus mellerborgi* Boh., so named because it measures only three-sixteenths of an inch compared with the half-inch length of the larger root borer *Cosmopolites*. During December 1943 the writer took the still smaller *Stenommatus musae* Mshll., only one-eleventh of an inch in length. This weevil was kindly determined by Mr. E. C. Zimmerman of the Bishop Museum, Honolulu. Its extreme range is from Hawaii in the north, Tahiti in the east and to Java in the west. Previously the latest specimens in our departmental collection were taken in 1925 by Mr. C. T. McNamara, a Plantation Inspector.

REFERENCE.

(1) Lever, R. J. A. W., 1940. *Agric. Journ.* Fiji, Vol. 11, No. 4, December, p. 108.

6. DUNG PREFERENCES AND NOMENCLATURE OF THE LOCAL HOUSE-FLY.

It is generally accepted in Europe that the preference for egg laying in the house-fly (*Musca domestica* L.) is for horse and pig dung (each being at times more attractive than the other) with cow dung very low in the list.(1) A recent Russian paper (2) however challenges this belief as it shows that in northern Russia in 1942 the pupations were 81·75 per cent in pig dung, 51·5 per cent in cow and only 47 per cent in horse dung. Simmonds (3) in 1928 found that in Fiji the local fly breeds normally in cow dung, does not refer to pigs and states that the fly was " undoubtedly a different species " from *Musca domestica*.

As no local work has apparently been done on the relative attractions of different dungs this was undertaken in April and May 1944, the pupation figures being 36 per cent in pig dung compared with 64 per cent in cow dung. Horses in the Suva Peninsula, where the work was carried out, are now rare enough not to be a serious source of breeding in the town area.

Another instance of the great attraction of local flies for cow dung was seen at Vunidawa where stomach contents from butchered animals were found to be very heavily infested with maggots, the entrails having been thoroughly disposed of by burying.

So far as Simmond's remark about the name of the local species, this point was cleared up in 1938 when the present writer asked the then Director of the Imperial Institute of Entomology whether *domestica* or *vicina* was present in Fiji. The reply, written in June 1938, was that *vicina* (with a narrow front in the male) is merely the tropical variety or subspecies of the typical *domestica* of temperate climates and specimens in the British Museum from Fiji are all referred to *Musca domestica* L. var. *vicina*. This is also the opinion of the entomologists of the Bernice P. Bishop Museum, Honolulu, who identified local specimens sent in 1941 as *M. domestica*.

REFERENCES.

(1) Austen, E. E. 1924.—The House Fly. Economic Series 1A. British Museum, London.
(2) Leikina, L. I. 1942.—(From *Review of Applied Entomology*, Series B, Vol. 32, Part 1, p. 5, 1944.) Moscow.
(3) Simmonds, H. W. 1928.—*Agric. Journal.*, Fiji. Vol. 1, No. 1, p. 13.

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7. NOMENCLATURE OF SOME MOSQUITOES AND A NEW LOCAL RECORD.

In a previous issue of this *Journal* (1) the interesting swamp mosquito was referred to as *Mansonia brevicellulus* Theo. 1901 but this name was preceded by *M. crassipes* van der Wulp 1892 and so the latter has priority. Owners of copies of Paine's bulletin (2) should therefore substitute this name on pages 9 and 15. Young stages were again found in May 1944 in the same swamp where the larvæ were first taken in August 1943. Both larvæ and pupæ were attached to subaquatic roots of the sedge *Eleocharis* or " kuta," the pupæ being fixed by their trumpets, which are thin and pointed (and thus unlike the normal type) in the same way as the larvæ are fixed by the apex of the thorn-like siphons referred to in the September issue.

The March number (3) dealt with *Aedomyia*, first recorded from Fiji last year, and it is now necessary to draw attention to another change in nomenclature. The species *venustipes* Skuse is apparently confined to Australia, Taylor's Oriental region (4) being incorrect, and the local species is after all *catasticta* Knab. This accounts for the puzzling record of *Pistia* and other higher plants as being selected elsewhere by *venustipes* larvæ as the local species was found frequenting algæ or lumi, a species of *Nitella*, which is similarly recorded in Australia as providing cover for the larvæ.

A new record for Fiji is *Aëdes* (*Geoskusea*) sp. near *longipalpis* Edw. whose larvæ were found in the so-called crab holes, really made by the mud lobster *Thalassina anomala*. The term " crab hole " is so well fixed in popularity, especially to golfers, that it is realised it is hard to supplant it by the name of mangrove or mud lobster, the " mana " of the Fijians. This mosquito appears to have been recorded elsewhere only from the Solomon Islands, unless it is a new species.

So far the writer has taken it only at Tamavua and Levcti in the Suva area, but a search elsewhere in its restricted breeding place will doubtless show it to be distributed throughout the coastal area of the larger islands of the Colony.

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(1) R. J. A. W. Lever, 1943.—*Agric. Journal*, Fiji, Vol. 14, No. 3, Sept. p. 79.
(2) Paine, R. W. 1935 and 1943.—Bulletin No. 22, Department of Agriculture, Fiji.
(3) Lever, R. J. A. W. 1944.—*Agric. Journal*, Fiji, Vol. 15, No. 1, March, p. 18.
(4) Taylor, F. H. 1934.—Service Publication No. 1, School of Public Health, Sydney.

LETTERS TO THE EDITOR.

To The Editor—

DEAR SIR;

I have read with considerable interest Mr. d'Espeissis' article on the possibilities of using shingles on roofs in Fiji—which appeared in the issue of March, 1944.

When I first arrived in Fiji, many of the Government buildings in and around Suva were roofed with shingles, which were all sawn and I believe came from the U.S.A.

The shingles were very wide and were laid so as to form " vikinged " lines; shingles were used on many of the buildings erected on outside stations—an example being Korovou, Tavua police station, where they had been used to roof police officers' quarters. These buildings were erected shortly after Mr. A. B. Joske assumed control of the provinces of Colo North and Ra and were not demolished until about 1937. The shingles on these houses were still in a fairly sound condition when the buildings were taken down.

Until about 40 years ago, shingles were the rule rather than the exception in many of the outlying areas in the North Island of New Zealand. Sawn shingles were not favoured in that country because of the fact that the saw when cutting the shingles, was likely to cut across the grain of the timber and this, it was claimed, hastened decay.

The size of shingle favoured for roofing dwelling houses was 16 inches in length by 4 inches in width by three-eighths of an inch in thickness and the timber used was usually " kahi katea " (white pine), of if available " totara "; a roof of the former would last for twelve years and over, whilst one composed of the latter timber was good for upwards of fifty years.

The local Fijian timbers—" kauvulavula " and " dakua salusalu "—would in their natural state most closely approximate the above two New Zealand woods in the matter of respective durability. In the times to which I refer, very little (or nothing) was known in New Zealand of artificial preservatives for wood; " kahi katea ", which is similar to " kauvulavula ", had to depend on its own natural durability, but " kauvulavula " would, if given a preservative bath, I believe, make a roof that would last for twenty years.

The daily tally of shingles given by Mr. d'Espeissis seems to be somewhat low, and the price per 1,000 rather high; a fairly expert shingle splitter in my country and time would split 1,000 16 inch by 4 inch by $\frac{3}{8}$ inch shingles

per day and there were men who could split as many as 1,500 per diem. The price paid was 10s. per 1,000 and the wages for an ordinary labourer were 8s. per eight-hour day. Whilst not expecting that a Fijian would attain to the tallies mentioned above, I think that 500 per day in either " kauvulavula " or " dakua salusalu " should be quite within his ability—after a little practice.

Mr. d'Espeissis mentions 30° from the horizontal as being the pitch of his roof; this seems to me to be rather too flat to ensure a tight roof. In my country the pitch on the roof of a dwelling house was 60° from horizontal and round about 45° from horizontal for barns and sheds. 60° might, at first glance, appear to be steep, but when one remembers the quantities of water a roof has to shed in this country, it is not too steep. Anyway, it would appear to be better to err on the steep side and be sure of a tight roof, than on the side of flatness and risk having a leaky one

It takes (allowing for wastage) 1,000 16 in. by 4 in. by $\frac{3}{8}$ inch shingles to cover a square of 10 ft. by 10 ft. = 100 square feet; 4 in. by 1 in. material was what we used as purlines. Rafters overhung the walls 8 inches and the first purline was nailed to the end of the rafters and one immediately above the top plate, and between these two and all subsequent purlines at 4 inch centres from the centre of purline above the top plate. First, nail a row of half-shingles, i.e. 8 in. shingles along the eaves along the line of the first purline, then a row of 16 in. shingles over the half shingles; being careful to break all joints and see that the lower ends of these shingles are flush with the lower ends of the half shingles; now shift your line up 4 inches and put on the next row of 16 in. shingles and so on to the apex of the roof—this will give you a completely watertight roof, each shingle covering 4 in. by 4 in.

Do not accept shingles which have been split off the " back " because it is almost impossible to prevent them from turning up at the sides, thus allowing water to run under them. They also have a tendency to split down the centre. Those split on the quarter do neither of these things. Never nail a shingle in the centre but use two nails to each one, driving them $\frac{5}{8}$ in. from the sides in such a way as secure the shingle you are affixing together with that below to the purline. $1\frac{1}{2}$ in. nails are used to nail on the shingles. Particular care should be taken to see that the overlapping shingles cover the heads of the nails holding down the preceding row, thus protecting the nails from rust and prolonging considerably the life of the roof.

I am offering the above in a purely constructive spirit as I believe that Mr. d'Espeissis has taken a step in the right direction and would like him to make a success of his undertaking. I would also like to congratulate him on his article and hope that what I have written will prove useful to him.

I am, dear sir,

Yours faithfully,

THEO. D. RIAZ.

Navai, via Nadarivatu,
24th April, 1944.

To The Editor—

SIR,

The information given by Mr. T. D. Riaz in his letter is very interesting, particularly what he has to say about the use of shingles in New Zealand. In this respect it is interesting to note that the two species he mentions, i.e. " kahikatea " or white pine, (*Podocarpus dacrydioides*) and " totara " (*Podocarpus totara*), belong to the conifer group, which is characteristically free splitting, and that further both belong to the same genus as the local timber, which experience in the early days and recent experiments, indicate to be

probably the most suitable local timber for shingles, i.e. " dakua salusalu " (*Podocarpus vitiensis*).

Mr. Riaz points out that an output of 100 shingles per man per day is low. That is true. There are no expert shingle splitters in Fiji to-day and this figure is the average obtained by Fijians, whose only experience was the limited amount obtained in the course of the experiments described. This conservative figure was given on purpose in order to cover falling, cross-cutting and extraction operations, as well as the actual splitting of the shingles. Obviously output would improve with experience and 500 per day as estimated by Mr. Riaz for a Fijian for splitting alone might even be improved upon.

With regard to the question of pitch, the slope of the experimental roof described (i.e. 30° to the horizontal) is admittedly rather too flat; for, although 60° appears rather unnecessarily steep, it is better as Mr. Riaz says, " to err on the steep side and be sure of a tight roof."

Mr. Riaz' observations on sawing versus splitting and cutting on the " back" versus " quarter " are interesting and his views are supported by experience elsewhere. His helpful criticism is most opportune as plans for further experiments on the use of Fijian timbers for shingle roofs are now in train and it is hoped that from the knowledge so acquired shingles may be able to make a useful contribution to post war reconstruction in this Colony. If any of your readers can supply information on the use of Fijian timbers for shingles in the early days of the Colony it would be welcomed.

Yours faithfully,

J. L. D'ESPEISSIS,
Assistant Conservator of Forests.

Forest Office,
Suva.

11th May, 1944

VEGETABLE AND FRUIT PRICES, SUVA.

The prices of produce listed below were those prevailing in the Cumming Street Bazaar, Suva, on Saturday mornings for the period March–May 1944 and on the whole were not unfavourable to either purchaser or producer. Price fluctuations were mainly due to the law of supply and demand.

Vegetables.

1. *Native.*

Bele	3d.–6d. per lb.	Kawai	1d. per lb.
Breadfruit	½d.–1d. per lb.	Ota	6d. per lb.
Coconuts—		Rourou	3d.–6d. per lb.
Dry	2d.–4d. each.	Tapioca	1d. per lb.
Green	1d.–3d. each.	Vudi	5s. per bunch.
Duruka	½d.–1d. per lb.	Yam	1d.–2d. per lb.

2. *Others.*

Beans—		Ginger, green	3d. per lb.
Butter	1s. 6d.–3d. per lb.	Jackfruit	1s. 6d.–1s. each.
French	1s. 6d.–3d. per lb.	Lettuce	2d.–1d. each.
Lace	6d.–3d. per lb.	Marrow, Long	1s. each.
Long	3d.–2d. per lb.	Bush	3d. each.
Beet, silver	3d. per lb.	Mustard	3d. per lb.
China Cabbage	3d.–2d. per lb.	Okra	3d. per lb.
Carrots	3d. per bundle.	Onion, spring	3d. per bundle.

Chillies	3d.–2d. per lb.	Parsnip	3d. per lb.
Corn (green)	3d. per bundle.	Pumpkin	1d.–2d. per lb.
Cowpea	3d. per lb.	Radish	3d. per bundle.
Cucumber	3d.–1d. each	Tomato	1s. 6d. per lb.
Egg plant	3d. per lb.	Turnip	3d. per lb.
Garlic	2s. per lb.	Water cress	6d. per lb.

FRUITS.

Banana	4s.–5s. per bunch.	Pawpaw	3d.–6d. each
Granadilla	3d. each.	Pineapple	6d.–1s. 3d. each.
Lemon	1d. each.	Rock Melon	3d.–6d. each.
Mandarin	1s.–2s. per doz.	Soursop	6d. each.
Orange	9d.–2s. per doz.	Water melon	3d. per lb.

—H.R.S.

REVIEWS.

1. THE NEED FOR AGRICULTURAL RESEARCH IN THE COLONIES.

THE Colonial Research Committee Progress Report for 1942–3 stresses the need for basic surveys in all branches of agricultural science as a basis for a large variety of practical investigations. The report covers an examination of various fields of work including magnetic and meteorological services, research in relation to agriculture, fisheries, forestry, animal health and social sciences.

It admits that valuable efforts have been made by research workers in many colonies but submits that scientific facilities and terms of service must be improved and additional methods of recruitment and organization devised if research is to play a fully effective part in Colonial development.

The Report emphasizes the vital necessity of assuring continuity for research, deplores the waste of resources in the past due to retrenchment of research work in times of depression and it points out the need to free research workers from routine as much as possible—this is particularly necessary in the poorer Colonies where staffs are small.

The Committee considers that it is of fundamental importance to attract research workers of distinction to the Colonies and indicates means by which this object can be achieved. The Committee further recommends that a Colonial Fisheries Service should be formed—already a Fisheries Adviser has been appointed—and that species surveys should be conducted in Colonial waters.

Agricultural research in the Colonies has been much disorganized by the war but it is essential that research work on a full scale should be resumed as soon as possible and with such measure of reorganization and extension as may be necessary to meet post-war requirements. There is scope for further provision of staff and facilities for research in all the numerous branches of agriculture—genetics, physiology, nutrition, soil classifications, moisture requirements of crops, control of insect pests, manuring, drainage production, marketing, transport, engineering, animal health, pastures and many other factors which go to build up successful farming.

The Committee is under the able Chairmanship of Lord Hailey and its recommendations should carry considerable weight which, it is hoped, will result in a vast improvement in the facilities for research, especially in the smaller colonies where the need is constant. —H.W.J.

Crown Colonist, Feb.–May, 1944.

2. IMPRESSIONS OF A VISIT TO WEST AND EAST AFRICA BY THE SECRETARY OF STATE FOR THE COLONIES.

In a period of six weeks Colonel Oliver Stanley travelled some 20,000 miles almost entirely by air, and at a luncheon at the Royal Empire Society on 17th November, 1943, he spoke briefly on his general impressions.

He said he was touched by the extraordinary friendliness and courtesy which he experienced everywhere and the moderation and efficiency shown by deputations in giving their points of view.

Secondly, he was impressed by the magnitude of West Africa's war efforts.

Thirdly, the tremendous differences which exist in the various territories visited were striking in that there was no common political system, religion, culture, language, history or tradition between the different peoples in West Africa. The great differences created big difficulties in political development of the areas.

Fourthly, he gained the impression that political changes have been allowed to run ahead of the necesssary economic and social development an he felt that it was an urgent duty to see that economic and social developments were given their proper consideration in the future.

Fifthly, he was struck by the real demand for education, though admittedly that demand was more based on economic reasons than on the idea of education for its own sake.

Economically the territories will have to depend mainly on agricultural development which presents a great variety of problems, one of the biggest being the problem to get the farmer himself, always conservative, to adopt proved advances in technique and practice. It was obvious that education was one of the fundamental requirements of an improved agricultural system.

He was also impressed by the need for the ordered sensible development of secondary industries in all territories. The Army Trade Schools showed that natives were very quick to assimilate the training and made excellent fitters, carpenters, electricians, etc. He was very doubtful if ex-soldiers with such training would be prepared to return to a purely agricultural existence. This development of secondary industries must be, he said, one of our prime objects in post war development.

—H.W.J.

United Empire, Vol. 35 No. 1, 1944.

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3. RUSSIA'S SUB-TROPICAL CROPS.

Besides her famous black earth soils where some of the best cereals in the world are grown, Russia has also her sub-tropical areas. The following extract from a recent "best seller" may be of interest:—

> "The experimental station [at Batum] is conducting experiments in tea planting, citrus fruit growing, cultivation of quinine-, ether-, and rubber-bearing plants, the development of the tung tree, and in the various fields of plant physiology which this region would permit. It extends practical aid, advice and assistance to the collective and state farms. The agronomist stated that there were approximately 1,300 different varieties of trees and plants in the entire Botanical Garden.
>
> The enterprise gave indications of being very well administered."

—*Mission To Moscow* by J. E. Davies, 1943.

—R.J.A.W.L.

4. MOSQUITO CONTROL BY MEANS OF THE FREON " BOMB ".

Readers of this *Journal* may remember that in the issue for December 1943, there was an article, " New Weapons Against Insects ", in which was a brief description of the Freon aerosol " bomb " for use against mosquitoes in aircraft. Although in Fiji many people had seen, handled and even used these containers it was not possible to give details about it last year. Since then, these " bombs " have come off the secret list and the following are extracts from two articles which are reviewed in the *Tropical Disease Bulletin* for December 1943, i.e. the same month in which the article appeared in our local *Journal*.

The bomb is a small rounded drum five inches long and 2½ inches in diameter with a nozzle and valve release. It contains 18 fluid ounces of 20 per cent pyrethrum concentrate mixed with refined sesame oil dissolved in di-chloro-di-fluoro-methane. This long name is commercially known as Freon 12 and the fluid has been used for years in refrigerators. It is kept under a pressure of 85 lbs to the square inch so that when released it throws a fine fog or " aerosol " six to eight feet from the nozzle and the contents of one bomb, if used at one time, would kill all flies or mosquitoes in 100,000 to 150,000 cubic feet, the time of emptying being 12 to 14 minutes. Naturally the bomb is not to be used like this and one of its disadvantages is that irresponsible operators are tempted to waste the spray by over use. —R.J.A.W.L.

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5. COMPETITIVE RUBBER PLANTS.

Mr. G. R. Martin, of the London Advisory Committee for rubber research, in a recent paper read before the Royal Society of Arts in London, gave a resumé of plants containing rubber and of their qualities compared with rubber derived from *Hevea brasiliensis*.

He said that there were two factors which rendered most of the war plan substitutes of little value compared with *Hevea*, even in the present emergencies. The first was that most of the plants contained insufficient rubber to make extraction worth while; the second that no plant yielded chemically pure hydrocarbon and most of them yielded a complex mixture of vegetable substances of which rubber formed only a small percentage. There was no simple method of purification which was practical on a large scale and no product containing less than 10 per cent hydrocarbon was likely to be of any value as a source of rubber. The *Hevea* tree had a great advantage as it gave a large yield per acre at a low cost of production, with low maintenance costs and easy separation of best quality rubber from the latex.

The most promising competititors of *Hevea* were, he said, the woody vine *Landolphia tholloni* which produced African root rubber, " koksaghyz " the Russian dandelion, the woody climber *Cryptostegia grandiflora* and the Quayale bush *Parthenium argentatum*. Other plants included the bush *Euphorbia torucilli* and the tree *Ficus bogellitis*; the trees *Manihot glaziovii* (ceara rubber) and *Funtumia elastica*, which were widely planted in the early days of rubber plantations, but all faded out when *Hevea* rubber became abundant.

Rubber from *Landolphia* vines in Africa was found to be of excellent quality as it contained about 90 per cent of hydrocarbon but could not hope to compete with the *Hevea* tree because of the low acre yields from the vines and the difficult conditions under which they grew.

The Russian " koksaghyz " could probably be dealt with economically under conditions of mechanical cultivation and harvesting at a cost of about sixpence per pound, if it only contained more rubber; it was remotely

possible that selection could raise the yield to 20 per cent rubber and if so it would probably prove valuable.

The climber *Cryptostegia grandiflora* lent itself to mass production tapping as 10,000 plants could be planted to the acre from seed and grew about six feet in the first year. The stems, however, were only about one inch in diameter and needed supports and tapping was too slow in consequence, though the rubber was good in quality, containing about 75 per cent of hydrocarbon.

For the various reasons given it is clearly evident that none of the substitute plants can hope to compete with *Hevea brasiliensis*. —H.W.J.

From the *Crown Colonist*—February, 1944.

6. THE WEED FLORA OF FIJI.

In a paper published last year, *Mr. William Greenwood, of Lautoka, has recorded valuable data on weeds collected on the leeward coasts during the period 1917 to 1942.

The region covered comprises the greater part of the area devoted to sugar cane cultivation and many of the plants are now common weeds in cultivated land and along roadsides and drains.

Of the 169 species listed, the author finds that "one-third were in Fiji in 1860; one-sixth of the others arrived perhaps before 1900 and the rest since then". Nearly half are recorded for Fiji for the first time.

The observations on these plants extended to an altitude of about 2,000 feet and the notes given as to the date certain species were first recorded and their subsequent distribution are of great interest.

Reference is made to the following major weed species of the Colony:—*Urena lobata* L., *Acacia farnesiana* Willd., *Psidium guajava* Linn., *Clidemia hirta* Don., *Xanthium italicum* Morelli, *Solanum torvum* Sw., *Lantana aculeata* Linn., *Eichhornia crassipes* Solms., *Cyperus rotundus* Linn., *Ischaemum rugosum* Salisb. and *Sorghum halepense* (Linn.) Pers.

* Greenwood, W., "The Adventive and Weed Flora of the Leeward Coasts of Fiji" *Proc. Linn. Soc. Lond.*, Session 154, Pt. 2. 10, Feb. 1943.

7. REPLICATION—THE SAFEGUARD FOR UNCONTROLLED VARIATION.

A series of variable characters for the sugar cane crop is given which definitely shows how very variable an apparently uniform crop may be.

Examples, taken from actual data, portray variations in adjacent plot soils in moisture content, mineral constituents and organic matter; the number of stalks of cane in adjacent rows, the rate of growth of contiguous plants, the numbers and weights of stalks per foot of row in adjacent rows, percentage of moisture and of sugar in the cane in adjacent plots and many other variations.

With so many variable factors, the field investigator can only hope to achieve a satisfactory measure of accuracy by securing data from as many similarly treated plots as possible, that, is by replication. A number of measurements made by rapid approximate methods is more satisfactory than spending an equivalent time in making a few refined measurements.

Replication, therefore, is stressed as the fundamental safeguard in the attainment of reliable and unbiassed results.

(Evidence given before the recent Commission appointed to enquire into the Sugar Industry in Fiji showed that crop yields varied greatly, according to locality, class of soil, cultivation and other factors. In one mill district yields of cane per acre of 4 tons and of 54 tons were recorded where the average for the district was 20 tons per acre.) —H.W.J.

—*Hawaiian Planters' Record*, Vol. 47. No. 3, 1943.

EXTRACTS.

1. UNITED NATIONS FOOD CONFERENCE.

THE Secretary of State for Foreign Affairs (Mr. Anthony Eden) on 6th July, 1943, spoke in the House of Commons on the results of the Food Campaign which was held at Hot Springs, U.S.A., last year and at which 42 countries were represented.

The following brief extract from his speech may be of general interest:—

"The main object of the Conference was to ensure as far as possible freedom from want of food. The House will have noticed that the third resolution recommends that Governments should immediately begin the task of increasing food resources and improving the diets of their peoples in accordance with the principles and objectives outlined in the findings of the Conference. His Majesty's Government intend, despite the inevitable difficulties which the war entails, to press on with this aim. At the same time, it is clear that freedom from want of food depends largely on matters outside the scope of purely agricultural or nutritional policy. This was fully recognized by the Conference, which took account of the broad questions of international security and economic expansion which are the necessary background of sustained progress towards freedom from want and a higher standard of living.

Resolution II provides for the establishment of an Interim Commission to carry on the work of the Conference and to prepare a plan for a permanent organization in the field of food and agriculture. His Majesty's Government intend to participate fully in the work of this Commission and are arranging to appoint a representative. They note with satisfaction that one of the tasks of this Commission will be to draw up a formal declaration or agreement for the consideration of Governments; in this instrument the Governments would recognize their obligation towards their respective peoples and to one another to collaborate in raising levels of nutrition and standards of living for their peoples, and to report to one another on progress made.

Finally, there is the question of production which bears closely on the relief of peoples living in the countries now occupied by the enemy. The Conference was not concerned with the organziation of relief supplies, but the House will note that due attention was paid to the necessity of increasing supplies of basic foodstuffs, in the period when territories liberated from the enemy will be in need of help from outside. His Majesty's Government are much impressed by the urgency and importance of this problem, and are determined to do all they can for their part to give effect to the resolutions of the Conference on this subject. They earnestly hope that other Governments will do likewise."

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2. SUGAR CANE AND SPREAD OF INSECTS.

The following extract is of local interest as it shows what resulted from recent neglect of cultivation to cane fields in Trinidad, the main pest being similar to our local army worm of rice and cane:—

"The long-term effects of leaving cultivation in a smother of grass and weeds, dense with froghoppers and caterpillars, hardly require emphasis. On one estate, in the past year, 1,215 acres out of 2,666 were stripped bare by the guinea grass worm within a fortnight: they have not recovered."

—*Crown Colonist*, January, 1944.

3. THE NEW BRITISH COUNTRYSIDE, THE HARVEST.

BEFORE the eighteenth century Britain was an agricultural nation. Then came the industrial revolution and the consequent change over from country farming life to life in the new industrial centres. To a great extent Britain lost touch with her land. However, this war is having the opposite effect and the land is claiming back the descendants of those who deserted the plough for the factory in years gone by.

This photograph shows a harvest of sugar beet, a crop which Britain has increased a hundred-fold since the beginning of the war. As a result of the great crops realized, a very large part of Britain's sugar needs are met at home, thereby reducing the amount of sugar which she has to import from overseas.

This particular crop is part of the yield of some 11,000 acres of land in one county of Britain alone.

The farmers' response to the appeal for greater production has been magnificent. Four million additional acres have been cultivated and have produced enough food for seventy-five per cent of Britain's population.

4. CHEMISTS FOR VICTORY.

THE constant need for quinine in war areas in the tropics is commonly known, of course, yet who but a chemist considers that thirty-eight different chemicals are required to produce its synthetic substitute, atabrine? We read frequently of the protection of human life on the battle fronts by the use of sulpha drugs, yet seldom consider that forty different chemicals are required for production of those drugs. Nor does public information on the technology of mechanized warfare usually include what Williams Haynes cites in his new book, *The Chemical Front*, namely, that "not one of the vaunted machines of modern war could be built" except for rayon, nylon, synthetic insulations, plastics and other products of chemical industry.

—From *New York Sun*, 9 December, 1943 in *Science Review* No. 6.

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5. ARTIFICIAL BREEDING.

ARTIFICIAL breeding of dairy cattle has been in systematic use in the United States of America for only five years. Yet more than 100,000 artificially bred calves were born this year in Wisconsin, Minnesota and New York, the biggest dairy states. Within twenty years a majority of the high-producing cows in the country will never see the bulls to which they are mated. Result will be a revolutionary improvement in the American cow and a great increase in production of dairy products.

In artificial mating semen taken from the bull is shipped out to trained men who inject it into cows that are ready for servicing. Instead of relying on a local bull of mediocre breeding, an ordinary farmer can breed his cow to the finest sires. Cost would ordinarily be prohibitive. But the amount of sperm solution which in natural mating would produce only one calf can be diluted to produce a possible hundred calves by the artificial method. This brings cost way down. A purebred bull can thus be used to service great numbers of cows. Through artificial breeding United States bulls in the postwar can rebuild or raise the standard of herds everywhere in the hungry world.

In most cases, a farmer who wants to adopt artificial breeding joins a co-operative organization which owns a group of purebred bulls. A farmer pays five dollars to join the co-operative, plus one dollar for every cow he lists. For every servicing, he pays five dollars, half of which goes to the co-operative and half to the inseminator. If first servicing does not impregnate the cow, inseminator will breed the cow a second and third time without extra charge.

The inseminator is a specially trained man, often a veterinarian, to whom the co-operative sends regular supplies of solution. When his cow is ready for breeding, the farmer notifies the inseminator who comes over and performs the artificial mating in the farmer's barn. This saves the farmer the trouble of carting his cow to a neighbourhood bull or, even more, the trouble and expense of keeping a bull of his own. Danger of contagious disease is also lessened.

Artificial breeding has been widely practiced in the Soviet Union for twenty years and has been of huge value in improving Russian herds. A few years ago an Argentine cattleman went to great expense to import by airplane sperm from a prize United States bull for one of his prize cows. After the war, such international interbreeding will be less expensive and more common.

—From *Life*, 13 December, 1943 in *Science Review*.

6. AGRICULTURE IN BRITAIN.

BRITAIN is mobilizing its fields as well as its factories; 7,000,000 more acres were put under the plough by the end of 1943. Britain is now the most highly mechanized farming country in Europe. The output per head of those engaged in agriculture has increased by 60 per cent since the beginning of the war. For every 100 tons of food produced before the war about 170 are now produced. Instead of importing two out of every three meals, Britain is producing two and importing only one.

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7. INSECTICIDE—RESISTANT INSECTS.

PAPER mill bacteria can become acclimatized to disinfectants and continue to form slime and rot paper-machine felts and The Institute of Paper Chemistry reports the discovery with industrial bacteria of a phenomenon long recognized in insect control. Black scale and California red scale have become resistant to hydrocyanic acid fumigation of citrus trees. Larvæ of the codling moth learned to resist arsenical sprays, and primary screw worm larvæ, an animal infestation, to survive the once deadly phenothiazine. The period of acclimatization varies from two to twenty-five years, and a remedy is to alternate insecticides over a considerable period; citrus trees, for instance, are treated with hydrocyanic acid one year and an oil spray the next, thus confusing the parasites. Fortunately no insect is expected to reach the ultimate in adaptability by learning to resist any regular sequence of attacks.

—*Science Review* 8.

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8. DESTRUCTION OF INSECTS IN PLANES.

The prevalence of insects in the cabins of aircraft depends on whether the aerodrome is on land or on water and the distance it is from shore. Mosquitoes are not disturbed by draughts of air when resting under seats, baggage compartments and the like. Interior disinfection of aircraft is insufficient, because mosquitoes and other insects may find safe harbourage in the space between the outer and the inner linings of the aircraft, in the hollow wings, in the space for retracted under-carriage and in various grooves and rivet holes.

For destruction of mosquitoes in aircraft to be effectual a suitable sprayer and insecticide (which is highly toxic to insects, innocuous to passengers, non-inflammable, non-corrosive, non-staining, stable in all climates and readily miscible with water) is essential. Water-soluble pyrethrum concentrate diluted ten to fourteen times with water immediately before spraying is commonly used. About 30 cc. of a 1:15 solution per thousand cubic feet (28 cubic metres) of space is sprayed by a nebulizer. The plane is sprayed about a half hour before landing, and its ventilators are closed for about ten minutes after spraying. Aeroplanes may be fumigated and opened prior to the embarkation of passengers.

Commander Jackson concludes that careful regulations under the direction of thorough and competent health officers with adequate equipment and personnel may be the sum and substance of controlling a condition that has tremendous potentialities for spreading disease and death.

Jackson, W. P.—1942. *Virginia Medical Monthly*, January. In *Trop. Dis. Bull.* Vol. 40, No. 7, July, 1943.